number of the nitro-groups increase, the compounds have a proportionally greater toxicity."

A useful section deals with the manipulation and working up of the finished explosives, grinding, mixing, the filling of shells by plain casting, casting under pressure to increase the density of the charge, and by pressing the solid charge.

The later chapters are devoted to questions on the use of explosives, the measurement of pressures, energy, etc.; then follows an appendix containing a comprehensive review of patents (which is supplemented later by a "Patents Register"). A short further appendix deals with specifications. This last section is extremely meagre, but possibly restrictions were placed on the author in respect to British specifications, and moreover those handling the materials have to be familiar with the requirements.

The volume is inconveniently large; much space might have been saved with advantage. For example, graphic formulæ are unnecessarily large; in one instance three formulæ almost fill one page; subdivision into separate chapters where collection under one heading was possible has led to much blank space, and some very simple diagrams have a whole page devoted to each.

IS PSYCHOLOGY ONE OF THE NATURAL SCIENCES?

Psychological Principles. By Dr. James Ward. (The Cambridge Psychological Library.) Pp. xiv+478. (Cambridge: At the University Press, 1918.) Price 21*s.* net.

PSYCHOLOGY, ever held in high honour as a philosophical science, is to-day claiming to be one of the natural sciences. Sometimes it is distinguished as the new psychology. It regards its subject-matter as amenable to treatment in laboratories, and in two directions, one educational and industrial, the other medical and therapeutic, it appears to have established its claim to be assigned a special realm of scientifically classified facts.

Since 1884, the year in which Dr. Ward wrote the famous "Encyclopædia Britannica" article, the output of this new psychology in books and journals and society proceedings has been enormous, its variety almost defying classification. It ranges from statistics and correlations to elaborate hypotheses of the fundamental nature of the reality of psychical phenomena. Throughout this whole period Dr. Ward's "Encyclopædia" article has stood almost unchallenged in its authority as the exposition of the principles which must govern every science of the soul. There are only two books which can compare with it in this respect—namely, James's "Principles of Psychology" and Stout's "Manual," and these are in no sense rivals, for each of the three is unique. Yet we cannot help sympathising with Dr. Ward's disappointed feeling that the conditions necessarily attaching to an article in an encyclopædia are a serious handicap to its usefulness compared with the unrestricted form of the separate treatise. At last, however, we are allowed to have this important work in a volume, and the wonderful thing is that it appears, not as an overdue promise in the fulfilment of which we have lost interest, but as a new work with all the freshness of youth; and the large additions to the original article are not makeshift appendages, but natural developments.

No one who reads this book can fail to appreciate the significant service Dr. Ward has rendered to psychology. It is evident alike in the paths he follows and in those which he avoids as side-tracks, or turns away from as false routes. We are not invited, for example, to begin with a more or less detailed description of the nervous system, and we are therefore spared altogether that illusion which so powerfully influences the psychologists whom it fascinates, the illusion that it is only a little gap in our science, an unfortunate hiatus we have not yet succeeded in bridging, which prevents us passing directly from physiology to psychology, from the science of the nervous system to the science of the mind. Again, with a clear conception of its utter futility, Dr. Ward rejects the notion that psychical facts belong to the same order of reality as physical facts, differing from them only in their diaphaneity and elusiveness, but capable of being mathematically treated by cunningly devised psycho-physical apparatus. Dr. Ward's attitude towards such method is shown in a characteristic note in the preface, in which, apologising for the retention of the chapter on "Memorising, Rhythmising, and Reading," originally inserted "by way of illustrating the so-called new psychology," he adds: "If there is one chapter more than another in the book which may be 'skipped,' it is this."

The greatness of this book is not in its negations, but in the clear and masterly way in which it sets forth the principles that govern psychology. No development of the science, or possible discovery, can affect these. First and foremost is the principle of the unity of the subject of experience with his experience. This is fundamental in Dr. Ward's view, and insisted on in striking arguments and clear expressions. The point of view of psychology is individualistic. Psychology is the science of individual experience. As presented to an individual, "the whole choir of heaven and furniture of earth" may belong to psychology.

In close connection with this definition of the subject-matter and scope of psychology is the principle of the indissolubility of the subject-object relation in experience, and the inseparability of its factors into subjects of experience on one hand, and objects of experience on the other. The subject-object relation is not a dualism of two terms, but a duality in unity. The importance of this principle in regard to the status of psychology as a science can be easily seen. In the physical sciences we select among the objects of experience special groups and classes and treat them on the assumption that they are in their essence what they are known to

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be, that they are independent of the knower, and that they interact among themselves according to laws of nature. The whole success of physical science depends upon the justification in experience of this assumption. We cannot delimit the subject-matter of psychology in any such way. Subjects of experience are not a class of objects, and do not interact with objects in the way we assume that objects interact with one another. Psychology, therefore, is not one of the sciences in the sense that it possesses its own section or has its own department of the general stuff of reality. It deals with the whole of reality, but in a particular aspect and from a particular point of view.

The other fundamental principle on which Dr. Ward insists is closely allied to this, but still far from receiving general recognition. In psychology we are studying the activity of monads. The essence of this concept is that every subject of experience mirrors the whole universe from an individual point of view. There is no common universe which all subjects of experience share; the interaction of monads must be explained by a different scheme from that which serves us in physical science.

One-third of this book (chaps. xii.–xviii.) is new matter which had no place in the original "Encyclopædia" article. It is not new to those who have followed the vigorous development of Dr. Ward's thought in his Gifford lectures and occasional articles, and especially in the striking Henry Sidgwick lecture on "Heredity and Memory" (1913). It is no small compensation for the years during which we have had to resort to a reference library in order to study Dr. Ward's views that we have now in a single complete volume the gathered fruit of his life-work in its maturity.

H. WILDON CARR.

ORGANIC AND APPLIED CHEMISTRY.

(1) *The Chemistry of Synthetic Drugs.* By Dr. Percy May. Second edition, revised and enlarged. Pp. xii+250. (London: Longmans, Green, and Co., 1918.) Price 10*s.* 6*d.* net.

(2) *Organic Chemistry for Advanced Students.* By Prof. Julius B. Cohen. Second edition. Part i., "Reactions," pp. viii+366; part ii., "Structure," pp. vii+435; part iii., "Synthesis," pp. vii+378. (London: Edward Arnold, 1918.) Price 54*s.* net.

IT is a healthy indication of the increased interest which is being taken in applied chemistry that so much of the literature published at the present time deals with questions connected with the future development of chemical industry in this country. It is, of course, well known that at the outset of the war we experienced considerable difficulty in maintaining the supply of many of the synthetic drugs which up to that time had been procured almost entirely from Germany, and, but for the voluntary work done in many of the educational laboratories, there would have been no supplies whatever of some of the most valuable local anæsthetics.

(1) The publication of the second edition of Dr. May's well-known book is, therefore, to be welcomed in the hope that it may help to attract workers to a branch of chemistry which has not hitherto received in this country the attention which it merits. The text of the new edition does not differ materially from that of its predecessor, but we note that the chapter on "Organic Antiseptics" now contains a short account of Ehrlich's work on the trypanocidal dyes trypan blue and trypan red, as well as a mention of the flavines and their use in the treatment of wound infections. The inclusion of the chloramines in chap xii. is also a new feature, and the section on salvarsan and its related compounds has been extended and brought up to date.

The book contains much useful and interesting information, and will no doubt continue to be freely consulted by those engaged in the manufacture of synthetic drugs.

(2) The publication of the second edition of Prof. Cohen's well-known book, however, serves as a timely reminder that no real progress can be made without a scientific foundation, and that the future of chemical industry is dependent upon the supply of scientifically trained chemists who must be conversant with the fundamental principles underlying the modern developments of their science. Since the publication of the first edition of this book in 1907 it has undoubtedly played a very important *rôle* in the training of students of chemistry in this country, and has been freely consulted both by students and by their teachers. The present edition has altered somewhat in outward form, consisting as it does of three volumes instead of two. The three volumes are devoted to "Reactions," "Structure," and "Synthesis" respectively, and by this arrangement it has been found possible to group together allied subjects and link them, so far as possible, in a consecutive form.

Considerable additions have been made to the subject-matter throughout the book; thus, for example, a useful chapter on "Abnormal Reactions" has been added to Part i., while in Part ii. the chapter on "Isomerism and Stereoisomerism" has been considerably improved by the inclusion of an account of recent work on the Walden inversion. The most important additions, however, have been made in Part iii., which deals with "Synthesis"; here we find considerably more space given to the carbohydrates for the discussion of the structure of glucose, the glucosides, and disaccharoses, as well as the chemistry of fermentation. The chapter on "Proteins" now contains a section on "Chlorophyll," but, curiously enough, no mention is made in the list of references to Willstätter and Stoll's book on this subject. The chapter on "Alkaloids" has been brought up to date by the inclusion of an account of Perkin's work on cryptopin and protopin, as well as a reference to Robinson's recent synthesis of tropinone. Considerable additions have also been made to the chapter on "Terpenes and Camphors." The new edition will be welcomed by all serious students of organic chemistry, and its success is assured.

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